

Claims

What is claimed is:

1. A reversible adhesive composition, comprising a mixture of:
a free radical polymerization initiator activated by actinic light
an alkoxyated acrylate; and
a pharmaceutically acceptable filler,
wherein the reversible adhesive composition is cured by exposure to actinic light and the cured reversible adhesive composition loses its adhesive properties when exposed to ultrasonic waves/vibrations.
2. A reversible adhesive composition according to claim 1, wherein the free radical polymerization initiator comprises a benzophenone, a substituted benzophenone, or a mixture thereof.
3. A reversible adhesive composition according to claim 2, wherein the substituted benzophenone comprises one or more constituents selected from the group consisting of methyl, ethyl, and propyl groups, and combinations thereof.
4. A reversible adhesive composition according to claim 2, wherein the substituted benzophenone is selected from the group consisting of 2,4,6-trimethylbenzophenone, 2,4-methylbenzophenone, 2,6-methylbenzophenone, 2-methylbenzophenone, 4-methylbenzophenone, and mixtures thereof.
5. A reversible adhesive composition according to claim 4, wherein the mixture of benzophenones comprises about 70 to about 90 percent 2,4,6-trimethylbenzophenone and about 10 to about 30 percent of a benzophenone selected from the group consisting of 2-methylbenzophenone, 4-methylbenzophenone, and mixtures thereof.
6. A reversible adhesive composition according to claim 1, wherein an alkoxy component of the alkoxyated acrylate is selected from the group consisting of methoxy, ethoxy, propoxy, and butoxy groups.

7. A reversible adhesive composition according to claim 1, wherein the alkoxyated acrylate comprises an alkoxyated acrylate derivative comprising one or more constituents selected from the group consisting of linear or branched alkanes, alkenes, or alkynes; ethers; esters; acids; fats; sugars; and mixtures thereof.
8. A reversible adhesive composition according to claim 1, wherein the pharmaceutically acceptable filler is selected from the group consisting of aluminum oxide; α -quartz powders; clay; talc; silica; diatomaceous earth; titanium dioxide; calcium carbonate; starches; sugars; and mixtures thereof.
9. A reversible adhesive composition according to claim 8, wherein the pharmaceutically acceptable filler comprises a naturally occurring starch.
10. A reversible adhesive composition according to claim 9, wherein the pharmaceutically acceptable filler is selected from the group consisting of corn starch, potato starch, wheat starch, and mixtures thereof.
11. A reversible adhesive composition according to claim 8, wherein the pharmaceutically acceptable filler comprises corn starch.
12. A reversible adhesive composition according to claim 1, wherein the mixture comprises:
about 0.5 to about 10 parts by weight of the free radical polymerization initiator;
about 0.5 to about 10 parts by weight of the alkoxyated acrylate; and
about 0.25 to about 20 parts by weight of the pharmaceutically acceptable filler.
13. A reversible adhesive composition according to claim 1, wherein the mixture comprises:
about 1 part by weight of the free radical polymerization initiator;
about 1 part by weight of the alkoxyated acrylate; and
about 0.25 to about 1 part by weight of the pharmaceutically acceptable filler.
14. A reversible adhesive composition according to claim 1, wherein the reversible adhesive composition is a dental adhesive.
15. A reversible adhesive composition according to claim 14, wherein the reversible adhesive composition bonds a dental apparatus to a tooth surface.

16. A reversible adhesive composition according to claim 15, wherein the dental apparatus is selected from the group consisting of crowns, caps, braces, fillings, inlays, and veneers.
17. A reversible adhesive composition according to claim 15, wherein the dental apparatus comprises a material selected from the group consisting of porcelain, gold, silver, metal composites and metal alloys.
18. A reversible adhesive composition according to claim 1, wherein the components of the mixture are pre-mixed and stored in a container impervious to actinic light.
19. A reversible adhesive composition according to claim 1, wherein the free radical polymerization initiator and alkoxylated acrylic are mixed together and stored in a container impervious to actinic light.
20. A reversible adhesive composition according to claim 1, wherein the cured reversible adhesive composition disintegrates upon exposure to ultrasonic waves/vibrations by carbon-oxygen bond breakage.
21. A method for reversibly bonding two surfaces together, comprising:
- a) forming a reversible adhesive mixture comprising
 - i) a free radical polymerization initiator activated by actinic light,
 - ii) an alkoxylated acrylate, and
 - iii) a pharmaceutically acceptable filler;
 - b) applying the reversible adhesive mixture to a first surface;
 - c) placing a second surface in contact with the reversible adhesive mixture on the first surface;
 - d) curing the reversible adhesive mixture by exposure to actinic light; and
 - e) optionally subsequently exposing the cured reversible adhesive mixture to ultrasonic waves/vibrations to cause the cured reversible adhesive composition to lose its adhesive properties and release the first and second surfaces.
22. A method according to claim 21, wherein the first surface is a tooth surface and the second surface is the surface of a dental apparatus.

23. A method according to claim 22, wherein the dental apparatus is selected from the group consisting of crowns, caps, braces, fillings, inlays, and veneers.
24. A method according to claim 23, wherein the dental apparatus comprises a material selected from the group consisting of porcelain, gold, silver, metal composites, and metal alloys.
25. A kit comprising:
a free radical polymerization initiator;
an alkoxyated acrylate; and
a pharmaceutically acceptable filler.
26. A kit according to claim 25, wherein:
the free radical polymerization initiator comprises about 0.5 to about 10 parts by weight;
the alkoxyated acrylate comprises about 0.5 to about 10 parts by weight; and
the pharmaceutically acceptable filler comprises about 0.25 to about 20 parts by weight.
27. A kit according to claim 25, wherein:
the free radical polymerization initiator comprises about 1 part by weight;
the alkoxyated acrylate comprises about 1 part by weight; and
the pharmaceutically acceptable filler comprises about 0.5 to about 1 part by weight.
28. A kit according to claim 25, wherein the free radical polymerization initiator and alkoxyated acrylic are mixed together and stored in a container impervious to actinic light.
29. A kit according to claim 25, wherein the free radical polymerization initiator, alkoxyated acrylate, and pharmaceutically acceptable filler are pre-mixed and stored in a container impervious to actinic light.

30. A reversible dental adhesive composition, comprising a mixture of:

a) about 1 part by weight of a free radical polymerization initiator activated by actinic light comprising a mixture of about 77 to about 80 percent 2,4,6-trimethylbenzophenone and about 23 to about 20 percent of a benzophenone selected from the group consisting of 2-methylbenzophenone, 4-methylbenzophenone, and mixtures thereof;

b) about 1 part by weight of an methoxylated acrylate; and

c) about 0.25 to about 1 part corn starch,

wherein the reversible dental adhesive composition is cured by exposure to actinic light and the cured reversible dental adhesive composition disintegrates when exposed to ultrasonic waves/vibrations.